Technical Report EL-98-18
December 1998

US Army Corps of Engineers
Waterways Experiment Station

Terrestrial Invertebrates of Edwards Air Force Base, 1996

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Prepared for Edwards Air Force Base

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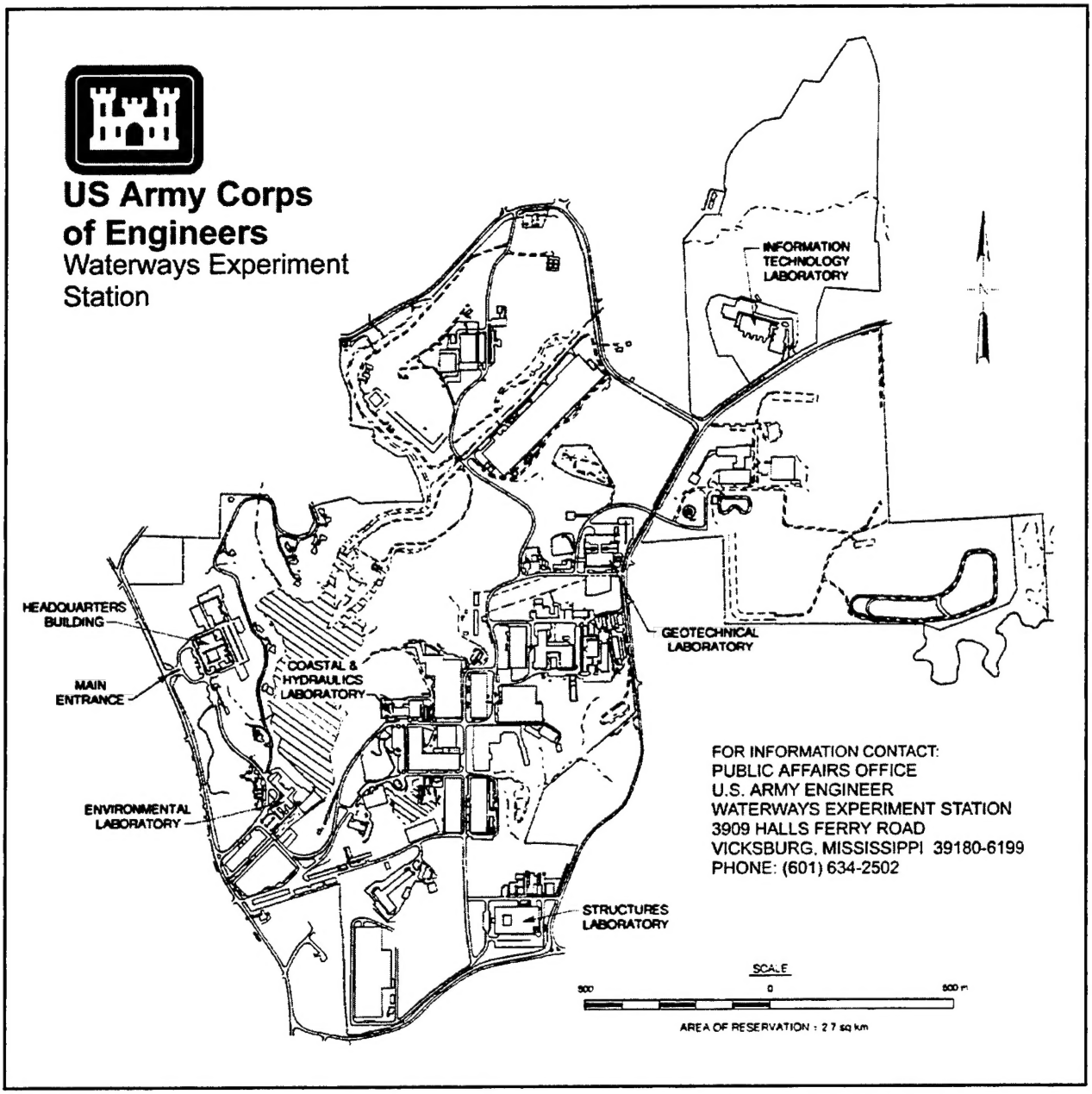

Waterways Experiment Station Cataloging-in-Publication Data

Pratt, Gordon.

Terrestrial invertebrates of Edwards Air Force Base, 1996 / by Gordon Pratt ; prepared for Edwards Air Force Base ; monitored by U.S. Army Engineer Waterways Experiment Station.

43 p. : ill. ; 28 cm. — (Technical report ; EL-98-18)

Includes bibliographic references.

1. Arthropoda — California. 2. Invertebrates — California. 3. Insects — Environmental aspects — California. 4. Rare invertebrates. 5. Edwards Air Force Base (Calif.) I. United States. Army. Corps of Engineers. II. U.S. Army Engineer Waterways Experiment Station. III. Environmental Laboratory (U.S. Army Engineer Waterways Experiment Station) IV. Title. V. Series: Technical report (U.S. Army Engineer Waterways Experiment Station) ; EL-98-18.

TA7 W34 no.EL-98-18

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Preface

Personnel at Edwards Air Force Base, Edwards, CA, are conducting a series of floral and fauna surveys. This is being done to check for Federally listed endangered or threatened species and to obtain information for an overall resource management plan. In the past, they have conducted surveys for tortoises, butterflies, birds, and eubranchipods (including tadpole, clam, and fairy shrimp). The report herein describes results of a survey for terrestrial macroinvertebrates conducted in 1996 by Dr. Gordon Pratt, University of California at Riverside, for the U.S. Army Engineer Waterways Experiment Station (WES) under Contract DACA39-39-96-0028. This report presents results from the first year of a 3-year study. Results of additional studies at the base will be published in annual reports similar to this.

During the conduct of this study, Dr. John Harrison was Director, Environmental Laboratory (EL), WES; Dr. Conrad J. Kirby was Chief, Ecological Research Division (ERD), EL; and Dr. Alfred F. Cofrancesco was Chief, Aquatic Ecology Branch, ERD.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Robin R. Cababa, EN.

This report should be cited as follows:

> Pratt, G. (1998). "Terrestrial invertebrates of Edwards Air Force Base, 1996," Technical Report EL-98-18, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

1 Introduction

Background

Edwards Air Force Base (EAB) is located in the Mojave Desert in southern California near Los Angeles. Terrain of potential value for terrestrial macroinvertebrates and other organisms consists of sand dunes, dry open hills, valleys, dry lakes or playas, smaller claypans, and pools. Vegetation around the playas consists of saltbush scrub; around the pools and claypans is saltbush scrub, Joshua tree woodlands, cottonwood and willow thickets, and mesquite basque. Playas and most pools are devoid of macrophytes (Branchipod Research Group 1993). The uplands are largely composed of creosote bush scrub.

EAB personnel are conducting a series of floral and fauna surveys. This is being done to check for Federally listed endangered or threatened species and to obtain information for a complete resource management plan. Previous surveys have been conducted on tortoises, butterflies, birds, and eubranchipods (including tadpole, clam, and fairy shrimp). Surveys are being done to obtain information on endangered or threatened species, as well as common species, to provide data for the proposed habitat management plan. This report, which presents findings from 1996, is the first of three annual reports that will describe terrestrial invertebrates at EAB. In addition to the terrestrial invertebrates, aquatic invertebrates are also being studied and will be reported separately. A final report will synthesize results of both studies and recommend management options to protect or enhance resources at EAB.

Desert invertebrates of the western Mojave are highly seasonal and dependent on winter-spring rains. In this desert, everything depends on water and its availability. Many of the leaf-litter species, such as Jerusalem and camel crickets, Diplurans, centipedes, and millipedes, only occur at the soil surface during the moister months of the year ranging from November to March or April. During the rest of the year, they are buried deep within the soil. Other invertebrates, such as butterflies, moths, and leaf-feeding beetles, and herbivorous flies follow the availability of their specific food plants and occur only when they are either flowering or leafing out. Many bees, wasps, beetles, and flies seem to seasonally follow a particular nectar source. Even though the desert may appear extremely dry during the hottest times of the year, it comes alive with invertebrates at night, such as large tenebrionid beetles, wasps, ants, spiders, scorpions, and solfugids.

This behavior is a response to the desert sun's hot drying effects. It would seem by the great invertebrate variation, particularly of the insects, that they are well adapted to the desert's severe often unpredictably changing environment.

Purpose and Scope

The purpose is to conduct a four-season survey of terrestrial macroinvertebrates in major habitats at Edwards Air Force Base, California. This is part of a 3-year study that started in 1996 and will end in 1998. This report includes data from the 1996 survey.

2 Study Area and Methods

Collecting Sites

The different localities for this survey were chosen to cover the base as widely as possible and as many different habitat types as possible. Unfortunately, there was some bias to these locations, since some areas were avoided because they require escorts and too much of their time to survey appropriately. These sites were defined from a central location with a half-mile[1] radius to form an approximate circular border. The sites chosen for the 1996 season are shown in Figures 1 and 2.

Methods

Since the author of this report specializes in butterflies, all of these organisms were easily identified by sight in the field. Initial identifications of the remaining insects were done to the family level through the keys of Borror, Delong, and Triplehorn (1981). This was not a simple task since there are over 650 North American insect families, each of which exhibits a great variety of different forms.

Specimens were then organized within each family by morpho species or groups that appeared similar enough to be the same species. Once this was done, various keys were used in some cases to identify the species or genus of the different morpho species. For instance, there are keys to the grasshoppers of California (Strohecker, Middlekauff, and Rentz 1968), genera of flies of North America (McAlpine et al. 1981), ants of California (Wheeler and Wheeler 1973), and antlions of North America (Stange 1970). In these cases, keys were used for identifications down to the genus or species level and then followed up by examining specimens in a reference collection. If the specimen(s) appeared morphologically to fall within the morphological variability of the species or genus, then the identification was accepted.

[1] To convert miles (U.S. statute) to kilometers, multiply by 1.609347.

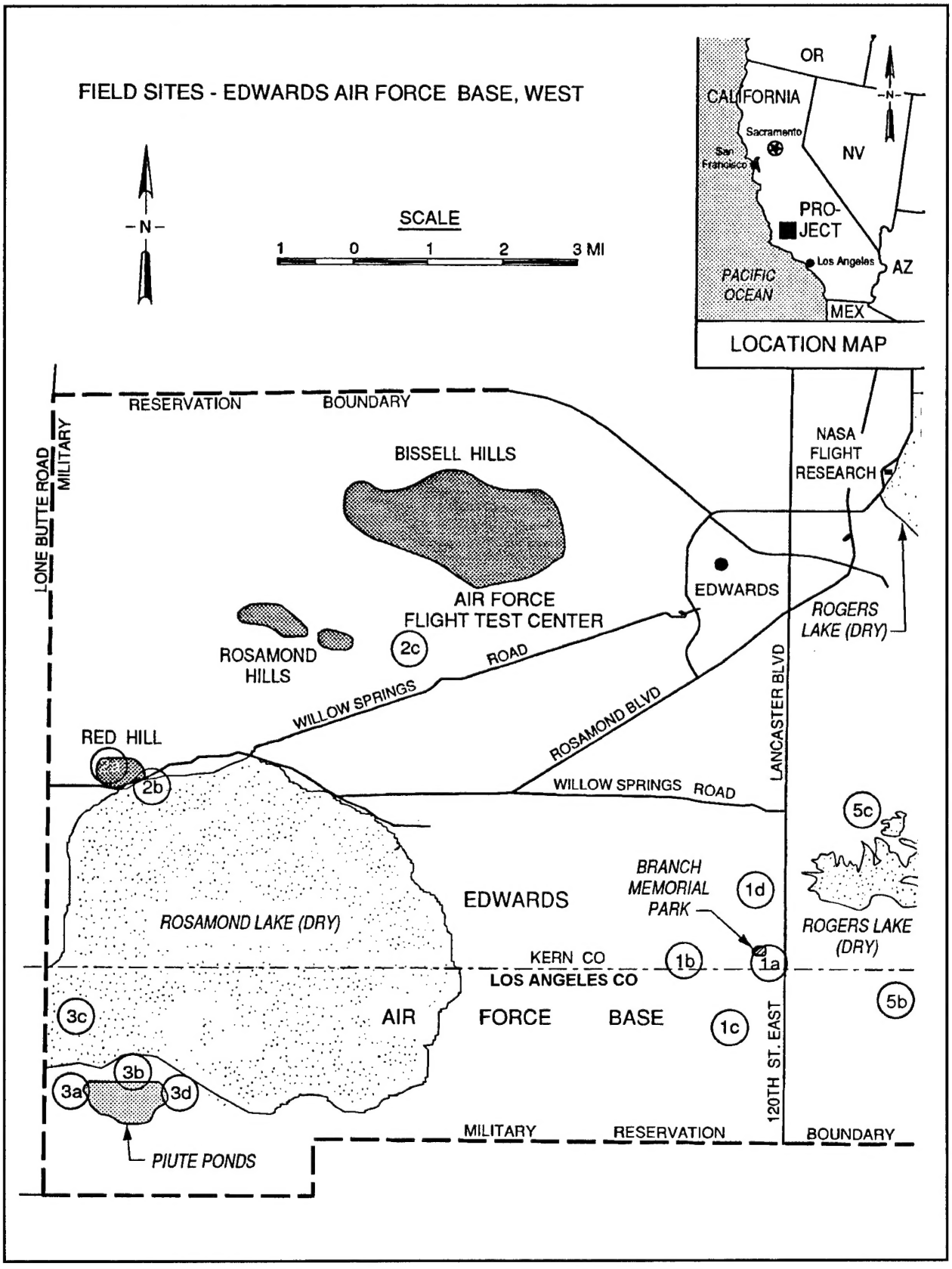

Figure 1. Sites on Edwards Air Force Base, West

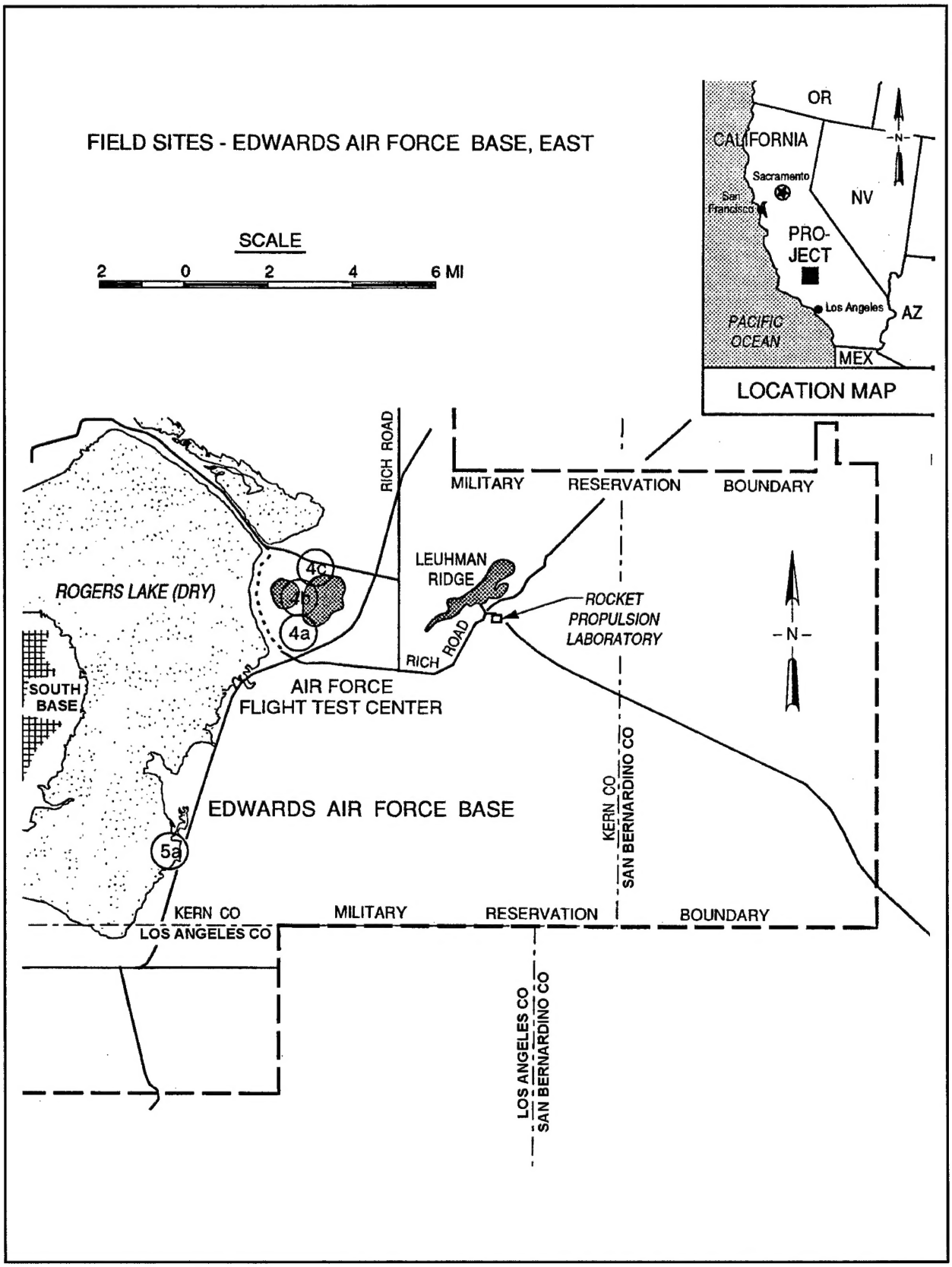

Figure 2. Sites on Edwards Air Force Base, East

In the other cases, the insect collection at the University of California at Riverside (UCR) was utilized exclusively for further identification. Most of these specimens in the collection had been previously identified by recognized authorities. The reason keys were not used with these groups is that keys were often lacking or not readily available because they were located in obscure places in the literature. Another problem with some keys is that they are broken into such small groups (like species complexes) making them virtually unusable to nonauthorities.

Identifications were done using the collection by scanning through specimens of the different species within each family of each species identified. Once the scanning was done (always with the aide of a microscope), the important characters that appeared to distinguish the species and genera within the family were determined. Then an effort was made, through the use of the determined characters, to match the species with one in the collection. With the lepidoptera, *The Moth Book* by Holland (1903) was of some additional help.

Once a determination was made, locality and abundance of the species within the collection also played important roles. If the specimen looked like two or three species in the collection, then the one species that had locality labels that overlapped that of the species on base was chosen. If more than one species had geographic patterns that overlapped the base, then the most common species was chosen. Often, once a determination was made, a combination of factors played a role in the acceptance of that determination. Only when there was little doubt due to morphological uniqueness was a species accepted with no overlapping locality labels.

Reliability of the identifications of the insects was most dependent on the number of species in UCR's collection and secondly on the keys. There is no better way to identify species than by utilizing a well-represented and curated collection. This collection was heavily biased towards the southwestern deserts, due to local collectors working this area more thoroughly than the rest of North America.

It is possible that some of these terrestrial organisms collected at the base have been misidentified. They could be due to misinterpretations of the characters used to identify the species or the absence of the species in reference collections. Some species and genera are lacking within UCR's collection because they have been sent out to authorities. These insects often are lent for 10 or more years until the authority has had a chance to work on them. Names can change over the years as new information becomes available. In some cases, misidentifications could be the result of confusing different forms or sexes of the same species, thereby listing one species as two. This problem was avoided by determining variability within each species of each family. Such errors are not uncommon since in the past some authorities have found males and females of the same species to be so different as to label them not only as distinct species but in different genera. Most misidentifications of species at the base will be at the species level, rather than at the genus level. Sibling or cryptic species require in most cases a key to distinguish them.

Reliability of some identifications can be variable. Since butterflies are the author's speciality, they are likely to be very accurate. The Diptera (true flies), antlions, ants (part of the Hymenoptera), and grasshoppers were probably next best identified because of availability and use of keys and an excellent personal reference collection. The Coleoptera (beetles) and the remainder of the Hymenoptera (bees and wasps) are also well represented in UCR's collection, so they were probably next best identified at least to the genus level.

3 Results

Eighty percent of the terrestrial invertebrates collected at EAB (Table 1 and Appendix A) belong to four orders: Hymenoptera, Diptera, Coleoptera, and Lepidoptera (moths and butterflies). Over 95 percent were found in these orders plus four more (Orthoptera, Homoptera, Hemiptera, and Neuroptera). One very rare Chrysopid, *Pimachrysa albicostales*, and a new species of Scarabaeid, in the genus of *Serica*, were collected by this study. Only two specimens of the *Pimachrysa* were previously known. A total of 974 invertebrates were identified from EAB. It is likely that the final species list will contain over 1,000 organisms.

There are two invertebrates that give a particularly nasty and perhaps deadly bite. These are the desert recluse (*Loxosceles deserta*) and the black widow (*Latrodectus hesperus*) (see the spiders in Table A1, Appendix A). Both spiders can be quite common on base. The black widow has been only found just north of Branch Memorial Park, but should be throughout most of the base in old mammal holes, under rocks, logs, and other debris. The desert recluse, one of the most common spiders on base, was found at a number of localities. These organisms seem to prefer to hide beneath trash, such as old washing machines and refrigerators. Gloves should be worn when collecting amongst these materials. A number of desert recluses were also found beneath cottonwood and Joshua tree logs. Because of the venomness of these two spiders, not all that were seen were collected.

Although there are a number of scorpions on base (one of which has been identified), none of these are likely to be very toxic. The sting of most scorpions are usually painful for only a few minutes. The only highly noxious or deadly California scorpion is quite rare and only found along the Colorado River. It is more common in Arizona.

It is quite likely that there is a *Triatoma* species (kissing or conenose bug) on base, but at present it has not been found. There is a species in both China Lake and Fort Irwin (in the western Mojave Desert) in habitats similar to those found on EAB. This species was common in China Lake and Fort Irwin during 1994. Unfortunately, detailed surveys were not conducted at EAB during that year. This bug was not found during the 1996 season at any of the three bases. These organisms are quite noxious because they carry a trypanosome, the deadly

Table 1
Numbers of Invertebrate Species on Edwards Air Force Base, 1996

Taxonomic Group	Number of Species	Percent of Total
Spiders	19	2.0
Scorpions	1	0.1
Millipedes	1	0.1
Collembolans	1	0.1
Thysanura	2	0.2
Ephemeroptera	1	0.1
Odonata	11	1.2
Orthoptera	41	4.2
Isoptera	1	0.1
Dermaptera	1	0.1
Homoptera	34	3.5
Hemiptera	56	5.7
Thysanoptera	2	0.2
Neuroptera	20	5.7
Coleoptera	154	15.8
Trichoptera	4	0.4
Lepidoptera	135	13.9
Diptera	214	22.0
Hymenoptera	276	28.3
Total	974	
Coleoptera, Lepidoptera, Diptera, and Hymenoptera	775	80.0
Plus Orthoptera, Homoptera, Hemiptera, and Neuroptera	930	95.5

Chagas disease. Fortunately, the method of transmission is quite complex, so incidents of disease are unlikely. Not only must they bite but the bug must defecate in the wound, and the person must scratch the trypanosome into the wound. The only records of this disease in the United States are from Arizona, and the North American variety of the trypanosome is a less virulent form than exists in South America. More information on these insects and the transmission of Chagas disease can be found in Schmidt and Roberts (1981).

There are a number of biting flies on base. These belong to the families Ceratopoginidae (no seeums), Culicidae (mosquitoes), and Tabanidae (horse and deerflies). There are also a number of species of bees (Andrenidae, Anthophoridae, Apidae, Colletidae, Halictidae, and Megachilidae) and wasps (Pompilidae, Sphecidae, and Vespidae) that can give nasty stings. The most potent stings are from the large cicada killer *Sphecius convallis* and the tarantula hawk *Pepsis chrysothemia*.

4 Discussion

There are at least two criteria that are important in determining the quality of a habitat and its value for preservation. One is the total number of species present and the other is the number of species considered to be threatened or endangered. Determining the total number of invertebrate species present in an area is not as difficult as determining the number of endangered species present. California desert invertebrates are poorly known, and EAB is no exception. For this reason, endangered invertebrates may not be easily recognized or identified. Previous descriptions in an area could be lacking. One biogeographic characteristic that is shared amongst most known California endangered invertebrates is their restricted localized ranges. Typically, most are endemic to very small areas. Therefore, it would be useful to identify species that exhibit restricted ranges or only occur at one or two very similar localities within EAB.

The species that exhibit restricted ranges on Edwards Air Force Base, i.e., unique species only found at one locality (Table 2), fall into two categories. One type will be species with actual restricted ranges, and the other will be rare species with wide ranges that were not encountered at the other localities simply because they are rare. The first type consists of true endemics, while the second type is identified as unique to the locality simply due to sampling bias. Since such rare species exhibit wide ranges, their frequencies should be relatively constant from one locality to the next. Therefore, the number of endemics should be the total number of unique species at a locality minus a relatively constant frequency of rare species. Unfortunately, the constant frequency of rare species is not known, so the next best thing will be the number of unique species to a locality. With increased surveys over time, rare species should be encountered at multiple localities, and eventually the number of unique species will equal the true endemics or the species with restricted ranges on base.

Of the 15 localities studied in this survey, only 2 exhibited more than 200 species, Sites 1a (362 species) and 3b (293 species) (Table 2). Because of time constraints, only 5 of the 15 localities had been searched for nocturnal insects with a mercury vapor light. Since both 1a and 3b were searched for nocturnal insects, they were both expected to exhibit larger insect totals than other localities that were only searched during the day; but still 1a and 3b exhibited numbers that far exceeded the other localities that had been searched for nocturnal insects.

Table 2
Total Species and Endemic Species per Locality at Edwards Air Force Base, 1996

Locality	Total Species	Number of Unique Species[1]	%Unique of Total Species	Habitat Types [2]
1a*	362	98	27.1	CW, SD, VP, SB, PO, MW, JT
1b	75	12	16.0	SD, VP, SB, MW, JT
1c	64	17	26.6	VP, SB, MW, JT
2a	118	18	15.3	CS, SB, SW
2b	67	9	13.4	CS, SB, SW
2c*	134	43	32.1	CS, SD, JT
3a	137	23	16.8	VP, SB, PO
3b*	293	103	35.2	VP, SB, PO
3c	89	13	14.6	VP, SB, JT
4a*	143	29	20.3	CS, SW, JT
4b	55	8	14.5	CS, SW, JT
4c[3]	101	15	14.9	CS, SW, JT
5a*	195	46	23.6	CS, SD, JT, DL
5b	138	28	20.3	VP, CS, SB, SD, MW, JT
5c	100	16	16.0	VP, SB, JT, DL

Note: * = Collection at night.
[1] Number of species found only in that locality.
[2] Habitat types are as follows: CW = Cottonwoods; SD = Sand dunes; VP = Vernal pools; SB = Saltbush scrub; PO = Ponds; MW = Mesquite woodland; CS = Creosote woodland; SW = Sandy washes; JT = Joshua tree woodland; DL = Dry lake playa.
[3] On September 18, changed night lighting from 4a to 4c because Rich Road was closed due to construction.

Only 2 of the 15 localities exhibited percent unique of total species above 30 percent (Table 2). One locality was 2c and the other was 3b. Site 2c was somewhat unique compared with the others, being that it was located at nearly 3,000 ft[1] elevation. All of the others so far studied for invertebrates at Edwards occurred well below this elevation. It is not surprising therefore that many of the species located at 2c were typical of the higher Mojave Desert. Three of the notable endemics of Site 2c were *Neduba ovata* (Gryllacrididae), *Philolithus setuosus* (Tenebrionidae), and *Givira mucida* (Cossidae). All three were common at higher elevations in Fort Irwin and China Lake. Because these species have much wider ranges throughout the Mojave, although they are localized within Edwards Air Force Base, they are not true localized endemics.

Site 3b (the north shore of Piute Ponds) had the highest number of unique species, as well as the highest percentage of unique to total species. Also, many of these unique species seem to require a permanent source of water. The collembolan species, which was found along the shores of the ponds, was not

[1] To convert feet to meters, multiply by 0.3048.

found elsewhere including any of the vernal pools, Branch Memorial Park pond, or the sewage ponds. This small and wingless invertebrate is not likely to have moved much into the desert. Many of the shore-inhabiting Carabid and three of the four tiger (Cicindelidae) beetles were found only along the shores of Piute Ponds. A sciomysid fly, *Pherbella vitalis*, a native parasite of snails, was only found along the northern edge of Piute Pond. Three tabanids were also only found around Piute Ponds. All of these semiaquatic and aquatic invertebrates, some with poor dispersal capacities, indicate that Site 3b is unique for the base and may have had permanent ponds long before man changed the area.

It was interesting that Site 2c, which was probably located the furthest from a water source, either permanent or vernal, had the only mayfly (Ephemeroptera), back swimmer (Notonectidae), and two of the four caddisflies (Trichoptera), all of which have aquatic larval stages. Perhaps the adults of these insects migrate out of the hot dry lowlands to aestivate or hibernate at cooler higher elevations. Site 2c is located near some of the highest peaks on base.

Some of the high species' diversities of areas with permanent water compared with other areas could be due to many insects remaining in diapause. The higher rainfall would arouse these species. Some of the species restricted to Site 3b may actually have much wider ranges. Those results may support or refute the idea that the ponds at Piute Ponds are much older than man's creation.

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Appendix A
List of Invertebrates at Edwards Air Force Base by Locality and Date

The following is a list of terrestrial macroinvertebrates collected at Edwards Air Force Base during the 1996 season. Macroinvertebrates were collected at localities listed in Table A1. Species noted with an asterisk (*) were collected by the author during a previous survey.

Table A1
Localities Surveyed for Terrestrial Macroinvertebrates at Edwards Air Force Base, 1996

1a	Branch Memorial Park
1b	South end of Buckhorn Dry Lake
1c	Area 2 miles south of Branch Memorial Park
2a	Red Hill
2b	Northwest end of Rosamond Dry Lake
2c	East end of Rosamond Hills
3a	West side of Piute Ponds
3b	North side of Piute Ponds
3c	1.5 miles north northwest of Piute Ponds
4a	1 mile north of Mercury Boulevard and 1 mile east of Rogers Dry Lake
4b	Peaks of northeast side of Rogers Dry Lake
4c	1.5 miles northeast of the peaks
5a	Sand dunes 2.5 miles north of Avenue B on west side of Mercury Boulevard
5b	Mesquite woodland north of Avenue B and west of intersection with 140th Street
5c	West side of sewage ponds on west side of Rogers Dry Lake

Macro-invertebrate	Order	Family	Species	Localities	Dates
Spiders		Araneidae	*Metepeira foxi*	3a, 5c	Apr 4
		Clubionidae	*Agroeca* near *omata*	3b	Jun 6
			Micaria (immature)	5a	Jun 26
			Syspira (immature)	1a	Jan 13
		Dictynidae	*Argenna* sp.	3b	Jun 2
		Filistatidae	*Kukulcania* sp. (Female)	1a	Jan 13
		Gnaphosidae	*Herpyllus hesperolus*	3c	Nov 20
		Lycosidae	*Allocasa subparva*	1a	Aug 6
			Pardosa sp. (female)	3b	Jun 6
			Schizocosa mccooki	3b	Oct 9
		Mimetidae	*Mimetus hesperus*	3b	Jun 6
		Philodromidae	*Tibellus chamberlini*	3b	Jun 6-Jul 11
		Pholcidae	*Psilochorus utahensis*	2c	Jun 13
		Salticidae	*Habronattus* icenoglei	5a	Jun 29
			Marena minuta	2c	Jun 13
		Sicariidae	*Loxoscelses deserta*	1a, 3c, 5b	Nov 1-Apr 18
		Theridiidae	*Latrodectus hesperus*	1a	Nov 8
			Euryopis californica	5a	Jun 29
		Thomisidae	*Xysticus californicus*	2a, 4b	Apr 9-May 2
Scorpions			*Hadrurus obsurus*	1a	Apr 16
Millipedes			*Orthoporus* sp.	2a, 4a	Nov 1-Mar 29
Insects	Collembola	Entomobryiidae	Species 1	3a	Apr 18
	Thysanura	Lepismatidae	Species 1	1a, 5c	Apr 11-Jun 26
		Machilidae	*Machilis* species	2c	Jun 13
	Ephemeroptera	Baetidae	*Baetis* species	2c	Jun 13
	Odonata	Aeshnidae	*Aeshna multicolor*	1a, 3a, 3b	May-Sep
			Anax junius	1a, 3a, 3b	Jun-Sep
		Libellulidae	*Libellula saturata*	1a, 2a	Jun-Aug
			Pantala hymenaea	5b	May-Jun
			Pachydiplax longipennis	1a, 3a, 3b	May-Aug
			Sympetrum corruptum	1a, 2a, 3a-b, 4a, 5b	May-Oct
			Tramera lacerata	1a, 3a, 3b, 4c	Jun-Aug
			T. onusta (rare)	3a	Jun
		Coenagrionidae	*Enallagma carunculatum*	1a-c, 2a, 3a-c, 5a-c	Apr-Sep
			Ischneura cervula	1a, 3a, 3b	Mar-Oct
			I. denticollis	3a	Apr
	Orthoptera	Acrididae	*Aeoloplides tenuipennis*	1a, 3a, 4b, 5a, 5c	Jun 13-Sep 18
			Amphilitornus coloradus	3a	Jul 11
			Anconia integra	2b, 3a, 4c, 5a-b	Mar 29-Sep 11
			Bootettix argentatus	2c, 4a	Jul 5-Sep 18
			Chimarocepha californica	3a-b	Apr 4-18
			Cibolacris parviceps	2b-c, 4a	Apr 2-Sep 18
			Cordillacris occipitalis	1a-c, 2b-c,4c, 5a, 5c	May 15-Jun 26

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Derotimena delicatulum	1a, 4a, 5a	Jun 26-Sep 18
			Eremiacris pallida	1a, 3a-c, 5a, 5c	Jul 5-Sep 25
			Hesperotettix viridis	1c, 3a-c, 5c	Jun 26-Jul 11
			Ligurotettix coquilletti	2b, 4a, 4c, 5a	Jun 13-Sep 11
			Melanoplus cinereus	4c, 5a	Jun 26-Jul 5
			M. devastator	2a, 5a	May 2-Jul 5
			M. yarrowii	3b	Oct 3-9
			Oedaleonotus enigma	3c	Jul 11
			Opeia obscura	3a	Apr 18-Jul 11
			Poecilotettix sanguineus	2b, 5a	May 15-Jun 13
			Psoloessa delicatula	1a-b, 2a-c, 3a, 3c, 4a, 5a-c	Jun 26-Sep 11
			Schistocerca vaga	5b	Jul 5
			Trimerotropis californica	1b, 3b, 4a, 5a	Jun 6-Sep 18
			T. inconspicua	4a, 4b	Jul 5
			T. pallidipennis	1a, 2a-c, 3a-b, 4a-c, 5a	Apr 2-Oct 17
			T. pseudofasciata	all sites	Apr 2-Nov 8
			T. rebellis	all but 3a-c	May 9-Jul 8
			Xanthippus olancha	2b	May 2
		Tettigoniidae	*Ateloplus luteus*	1a	Jul 8
			Capnobotes arizonensis	4a	Jul 5
			C. fuliginosus	4a, 4c	Jul 5
			Insara covilleae	2c	Jun 13
			Neduba ovata	2c	May 2
		Gryllacrididae	*Ceuthophilus californianus*	1a, 4c	Apr-May
			C. hesperus	1a, 4c	Apr-May
			Ammobaenetes sp.	1a	May 30
			Stenoplematus sp.	1a, 5a	Jan-May
		Gryllidae	*Gryllus assimilis*	1a, 2c, 3a-b, 4c, 5a, 5c	May 15-Sep 11
		Tanaoceridae	*Tanaocerus koebelii*	2c	Mar 29
	Dictyoptera	Mantidae	*Litaneutra minor*	1a, 5a, 3b	May 15-Jul 8
			Stagmomantis californica	3c	Sep 15
		Polyphagidae	*Arenivaga apache*	1a, 2c, 4a, 5a	Apr 16-Sep 11
			Arenivaga sp.	1a	Aug 6-Sep 15
			Eremoblatta subdiaphana	5a	Sep 11
	Isoptera	Rhinotermitidae	*Heterotermes* sp.	1a, 2b, 3a, 4a	Most of year
	Dermaptera	Carcinophoridae	*Euborellia* sp.	1b	Mar 18
	Homoptera	Delphacidae	*Delphacodes* sp.	2c, 3a, 3b	Jun 6-Sep 4
			Species 1	3a	Jun 6
		Cixiidae	*Oecleus decens*	3b, 4a, 5b	May 9-Sep 11
			Oliarus zyxus	3b, 5b	Apr 11-Jun 6
			Species 1	5b	Sep 11
		Dictyopharidae	*Acinaca* sp.	5a,	Jun 13
			Orgerius concordus	2c	Sep 11

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Flatidae	*Ormenis saucia*	1a, 4b	Jul 5-Aug 6
			Species 1	1b	Jul 8
		Issidae	Species 1	3a	Jun 6
		Membracidae	*Multareis cornulus*	4a-c	May 9-Jul 5
			Multareoides bifurcatus	2a, 4a, 4c	Jul 5-Nov 1
		Cicadellidae	*Aceratogallia californica*	1a, 2a-b, 3b-c, 4a-b, 5a	Apr 11-Oct 17
			Acinopterus dulchellus	5a, 5c	May 15-Sep 11
			Acinopterus sp.	5a-c	Apr 11
			Ballana sp.	1a, 5c	Apr 11-16
			Cochlorhinus sp.	5b	Apr 11
			Deltocephalus fuscinervosus	3a	Jun 6
			Empoasca fabae	3a-b, 5a	Apr 4-Jun 26
			Norvellina sp.	2c	Jun 13-Oct 17
			Opsius stactogalus	1a-c, 3b-c, 5a-c	May 30-Aug 6
			Scaphytopius irroratus	2a	Oct 17
			Texananus oregonus	2c, 3b	Jun 6-13
			Xerophloea peltata	3b	Jun 6
			Species 1	3b, 5c	Jun 6-Sep 11
			Species 2	3b	Jul 11
			Species 3	3b	Apr 18
			Species 4	3a, 4a	May 9-Jun 6
			Species 5	5a	Apr 11
			Species 6	4c	Jul 5
			Species 7	2a, 2c	Jun 13-Oct 17
		Cicadidae	*Okanagana vanduzeei*	4a	Jul 11
		Psyllidae	Species 1	3b	Apr 4
		Aphididae	Species 1	3b	Jul 11
	Hemiptera	Alydidae	*Alydus pluto*	1a, 3a, 3c	Jun 6-Jul 11
			Tallius setosus	2a, 3a	May 2-Jun 6
		Anthocoridae	*Anthocoris* sp.	1c	Jul 8
			Orius tristicolor	1a-b, 2a, 3a-c, 4a-b, 5a-c	Apr 4-Oct 22
		Coreidae	*Merocoris curtatus*	5b	Sep 11
		Corixidae	*Corisella decolor*	1a-b, 2c, 3b, 5a	Apr 18-Nov 8
		Cydnidae	*Pangaeus conguus*	1a, 4c	May 9-Jul 8
		Lygaeidae	*Emblethis vicarius*	1a, 2a	Mar 29-Jul 8
			Geocoris pallens	1a-b, 2b, 3b, 4a, 5a	Apr 9-Oct 22
			Lygaeus kalmii	1a, 2b	Apr 16-Jun 13
			Neacoryphus lateralis	2c	Oct 17
			Nysius tenellus	1a, 2b-c, 3a-c, 4a, 5a-c	Mar 18-Oct 22
			Pseudopamera nitidula	2c, 4c	Mar 29-May 9
			Xyonysius californicus	3c	Jun 6
		Miridae	*Chaetophylidea moerens*	1a, 4c, 5a, 5c	Apr 9-16
			Chlamydatus monilipes	2c, 4c	Mar 29-May 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Deraeocoris brevis	2c	Jun 13
			Hadronema princeps	2b,4a, 5a	Apr 9-May 2
			Haplomachides consors	4c, 5a	Apr 11-May 9
			Irbisia sp.	2b, 5c	May 2-15
			Lopidea confraterna	2b, 4c, 5a	May 2-15
			Orthotylus sp.	1a, 3c	Sep 25-Oct 9
			Parthenicus picicollis	2a, 2c, 4a	May 9-Oct 17
			Phytocoris albidopictus	1a, 2c, 4c	May 9-Jun 13
			P. ingens	4c	May 9
			P. plenus	2c	Jun 13
			Phytocoris ramosus	2c, 4c	Apr 2-Jun 13
			Rhinocloa forticornis	3c, 5a, 5c	Jul 11-Oct 22
			Taylorilgus pallidulus	all sites	Apr 9-Oct 22
			Species 1	5a	Apr 11
			Species 2	5a-c	Apr 11-Sept 11
			Species 3	1a, 5c	May 30-Sep 11
			Species 4	5b	Apr 11
		Nabidae	*Nabis americoferus*	3a, 5a-b	Apr 11-Oct 9
		Notonectidae	*Notonecta kirbyi*	2c	Jun 13
		Pentatomidae	*Acrosternum hilare*	2b	Aug 2
			Brochymena sulcata	5b	Jun 26
			Chlorochroa sayi	1a, 2c, 3a-c, 4a-c, 5a, 5c	Apr 2-Sep 11
			Dendrocoris contaminatus	2a, 4a, 4c	May 2-9
			Perillus splendidus	2b	May 2
			Tepa brevis	3a, 4b	Apr 9-Jun 6
			Thyanta custator	2c	Jun 13
			T. pallidovirens	3b, 4c	Jul 11-Aug 2
		Reduvidae	*Rasahus biguttatus*	3b	Jun 6
			Sinea diadema	1b, 3a, 3c	Jun 6-Oct 9
			Zelus renardii	1a, 1c, 2a, 3a-c, 5b-c	Jun 6-Oct 9
		Rhopalidae	*Arhyssus lateralis*	2a-b, 3a, 4a-b	Mar 29-Jul 11
			A. scutatus	5c	Apr 11
			Aufeius impressicollis	3a	Jul 11
			Boisea rubrolineata	3b	Jul 11
			Harmostes reflexus	1a, 2a, 3b-c, 5a-b	Mar 29-Sep 25
			Liorhyssus hyalinus	2b, 3c, 4a-b	Apr 9-Nov 1
		Saldidae	*Saldula pallipea*	3a-b, 5c	Apr 4-Jul 11
		Threocoridae	*Corimelaena lateralis*	3b	Jul 11
		Tingidae	*Corythucha morrilli*	5a	Apr 11
			Leptonypha minor	5c	Jun 26
	Thysanoptera	Thripidae	Species 1	3a	Jun 6
			Species 2	3a	Jun 6
	Neuroptera	Inocellidae	*Inocella inflata*	3b	Apr 11

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Chrysopidae	*Allochrysa arizonica*	5a	Apr 11
			Chrysopa carnea	1a-c, 3b-c, 4a, 5a-b	Mar 18-Oct 9
			C. plorabunda gp	1a	Jul 8
			C. nigricornis gp	1a	Aug 6
			Eremochrysopa punctinuris	1b, 3b-c, 4c, 5b-c	Apr 9-Oct 9
			Nothochrysa nr *californica*	4a	Nov 1
		Hemerobiidae	*Hemerobius pacificus*	1a	May 30
			Micromus subanticus	3b	Oct 9
		Myrmeleontidae	*Brachynemurus carrizonus*	1a, 2c, 3b, 4c	Jun 13-Sep 4
			B. coquilletti	1a, 3b, 4c, 5a	Jun 6-Sep 11
			B. eiseni	4a	Sep 18
			B. ferox	1a	Aug 6
			B. intermedius	2c, 4c, 5a	Sep 4-18
			B. longipalpis	1a-b, 2c, 3b, 4a, 4c	Jun 13-Sep 4
			B. minusculus	1a	Sep 25
			B. niger	1a, 5a	Jul 8-Sep 25
			B. quadripunctatus	1a	Jul 8
			B. sackeni	5a	Apr 11
			B. singularis	1a, 5a	Sep 11-25
	Coleoptera	Alleculidae	*Hymenorus montivagos*	1a, 3b	May 30-Jul 11
		Anobiidae	*Megorama ingens*	1a	Jul 8
			Tricorynus mutans	2c	Jun 13
			Xeranobium desertum	1a	Aug 6
			X. laticeps	2c, 4c	Jul 5-Sep 4
			Species 1	2c	Jun 13
			Species 2	1a, 2c	Jul 8
			Species 3	1a, 3b	Jun 6-Jul 8
		Anthicidae	*Anthus nanus*	4b	Jul 5
			A. punctulatus	1a, 3b	Jul 8-11
			Notoxus calaratus	1a	Jul 8
			N. robustus	3b	Jun 6
			Omnnadus floralis	2c, 5a	Sep 4-11
			Vascusus confinus	3b, 5a-c	Jun 26-Jul 11
			Species 1	2c, 3b	Jun 13-Jul 11
		Bruchidae	*Acanthoscelides* sp.	1b-c, 5a-b	Apr 11-Jul 8
			Algarobius prosopis	1a, 5b	Sep 11-25
			Mimosestes protractus	5b	Sep 11
			Species 1	2a	Jun 13
			Species 2	3b	Jun 6
		Buprestidae	*Acmaeodera lanata*	2a,3a, 4a, 5a-b	May 2-Jun 13
			A. labyrinthica	1a, 5a	Apr 11-Jun 6
			Chrysobothris debilis	5b	May 15
			Hippomelas obliterata	4a-c	Jul 5

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Hippomelas near *fulgida*	3b	Aug 2
		Carabidae	*Agonoderus maculatus*	2c, 4c	Jul 8-Aug 16
			Agonum funebre	3a, 3b	Apr 18-Jul 11
			Anisodactylus sp.	1a, 3b	Jul 5-Sep 5
			Armara insignis	2a	May 2
			Bembidion bifossulatum	3a-b	Apr 4-Jul 11
			B. Insulatum	3b	Apr 18
			B. variegatum	3b	Apr 18-Aug 2
			Bradycellus nitidus	3a	Apr 4
			Celia californica	1a, 5c	Apr 11-16
			Celia sp.	1a, 3a-b	Apr 4-Jul 11
			Harpalus lascivus	3a	Apr 4
			Lebia perita	3b	Jun 6
			Species 1	3b	Jul 11
			Species 2	3a	Apr 4
			Species 3	3b	Jul 11
		Cerambycidae	*Amanus pectoralis*	3a	Jun 6
			Crossidius coralinus	3a, 3c	Jul 11-Oct 11
			**C. hirtipes*	1c	Oct 11
			C. suturalis	1a	Sep 15-25
			Derobrachus geminatus	1a	Jul 8-Aug 14
		Chrysomelidae	*Altica carinata*	1a	Mar 18
			Chaetocnema ectypa	3a-c	Jun 6-Jul 11
			Dibolica undecimpunctata	2c, 3a-b, 4c	Jun 6-Oct 9
			Galerucella xanthomelaena	1a, 2a, 3b, 4c	May 2-Aug 6
			Pachybrachys desertus	2c, 4a, 4c	Jun 13-Nov 1
			Phyllotreta sp.	1a, 2c	Jun 13-Jul 8
			Species 1	1a, 3b	Aug 2-6
			Species 2	1a, 2b	May 2-Jul 8
		Cicindelidae	*Cicindela haemorrhagica*	3a-b	Jun 6-Oct 9
			C. oregona	1a, 3a-b	Apr 4-Oct 3
			C. tranqueberrica	3b	Oct 9-Apr 4
			C. willistoni	3b	Jun 6
		Cleridae	*Cymatodera oblita*	1a, 4a	Aug 6-Sep 18
			C. punctata	1a	Aug 6
			Enoclerus laetus	1a, 1b, 5b	Sep 11-25
			Loedelia maculicollis	4a	May 9
			Phyllobaenus scaber	4c	May 9
			Trichodes ornatus	2a, 4a-b	May 2-9
		Coccinellidae	*Coccinella novemnotata*	3a-b	Jun 6-Oct 3
			Hippodamia convergens	1a, 2b, 3a-c, 5c	Mar 18-Oct 3
			Hippodamia sp.	4c	May 9
			Hyperaspis sp.	2a	Oct 17

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Olla v-nigrum	1a	Aug 6
		Curculionidae	*Apleurus angulans*	3a, 4a, 5b	Jul 11-Nov 1
			Ophryastes argentatus	4a	Jul 5
			Sibinia setosus	1b	Jul 8
			Smicronyx imbricatus	1a	Jul 8
		Dermestidae	*Anthrenus lepidus*	1a, 3a-b, 5a-b	Mar 18-Jun 6
			A. rufipennis	5b	Apr 11
			Cryplorhopalum apicale	4b	May 9
			Dermestes marmoratus	1a	Aug 6
			Novelsis uteana	1a	May 30-Jul 8
			Trogoderma variabile	2a-c, 4c	May 2-Jul 5
		Dytiscidae	*Hygrotus* sp.	1d	Apr 18
		Elateridae	*Aeolus* sp.	3b	Jun 6
			Esthesopus dispersus	2c	Jun 13
			Horistonotus inanus	1a	Mar 18
			Octinodes frater	2c, 4c	Apr 2-May 9
			O. shaumi	1a, 4c, 5a	May 9-Jul 8
		Helodidae	*Cyphon variabilis*	3b	Jul 11-Aug 2
		Heteroceridae	*Heterocerus gnatho*	1a, 2a, 3b, 5a	May 30-Sep 11
		Hydrophilidae	*Berosus punctulatus*	3b	Jul 11-Aug 2
			Berosus sp.	3b	Jul 11
			Hydrophilus triangularis	3b	Jul 11-Aug 2
			Troposternus lateralis	3b	Jul 11
		Meloidae	*Cordylospasta opaca*	4a, 5b	Apr 9-11
			Cysteodemus armatus	5a	May 9
			Epicauta corybantica	1a-b, 3a-c	Sep 25-Oct 22
			**Epicauta puncticollis*	3c	Jun 9
			Eupompha elegans	1a, 5a	May 15-30
			Lytta auriculata	1c	Apr 16
			Lytta magister	4a	May 9
			Lytta stygica	2c	Mar 29
			**Lytta vulnerata*	1c, 3a	Oct 11
			Nemognatha macswaini	4a	May 9
			**Pleurospasta mirabilis*	1a, 3b	Jun 6
			Zonitis atripennis	1a	Sep 25
		Mordellidae	*Anthobates nubilis*	5b-c	Sep 11
			Mordella albosutura	2a, 4c	May 2-9
			Mordellistena sp. 1	1a, 4c	Apr 16-May 9
			Mordellistena sp. 2	1a	Jul 8
		Melyridae	*Amecocerus* sp. 1	1c, 4a, 4c, 5b	Apr 9-16
			Amecocerus sp. 2	4c	May 9
			Attalus difficilis	5a	Apr 11
			Attalus oregonensis	1b, 2a, 3b, 4a, 4c, 5a, 5c	May 9-Jun 26

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Attalus santarosae	4a-b	May 9
			Collops limbellus	5a	May 15
			Emmenotarsus sp. 1	2b, 5a	Mar 27-Apr 11
			Eschatocrepis constrictus	1a, 2a-b, 4a-b, 5b-c	Mar 29-Sep 11
			Eutrichopleurus mucidus	3a, 5a-b	Apr 11-Jun 6
			Pristoscelis irwini	4b, 5c	May 9-Sep 11
			Pristoscelis schlingeri	1a, 5a-c	Apr 11-16
			Pristoscelis sp.	2a	May 2
			Tanaops lobulatus	2a	May 2
		Nitidulidae	Species 1	1a	Aug 6
		Oedemeridae	*Rhinoplatia ruficollis*	4a	May 9
		Scarabaeidae	*Aphodius lividus*	1a, 5a	Aug 6-Sep 25
			Cremastocheilus schaumii	1b	Mar 18
			Cyclocephala longula	1a, 3b	May 30-Aug 16
			Diplotaxis subangulata	1a, 5a	Jul 8-Sep 15
			Gymnopyge hopliaeformus	2b, 4a	May 2-9
			Ligyrus gibbosus	1a, 3b	Jul 11-Sep 25
			Phobetus majavus	4c	May 9
			Serica elongatula	4c, 5a	May 9-15
			Serica new species	5a	May 15
		Staphylinidae	*Betonuchus* species	3b	Jul 11
			Coproporus species	2c	Jun 13
			Philonthus cruentatus	1a, 2c, 3b, 5a	May 30-Sep 11
			Species 1	2c	Jun 13
		Tenebrionidae	*Abolus verrucosus*	1a, 2c, 3b	Apr 2-Aug 6
			Aloephus species	2a	Jun 13
			Apsena rufipes	5c	May 15
			Araeoschizus andrewsi	1a	May 30
			Auchmobius picipes	1c	Jul 8
			Blapstinus pulverulentus	1a-b, 3b, 5a	Apr 16-Aug 2
			Blapstinus species	1a	Apr 16-Aug 6
			Coniontis ellyptica	3a-c	Apr 18-Jul 11
			Coniontis species	2c	Mar 29
			Eleodes armata	all sites	all year
			Eleodes Species 1	1a-b, 2c, 3b, 5a-b	Mar 29-Nov 8
			Eleodes Species 2	1c	Nov 8
			Edrotes ventricosus	1a, 5c	Sep 25-Apr 11
			Eusattus muricatus	1a-b, 5b	Mar 18-Jun 6
			Metopoloba sp.	1a	Aug 6-Sep 15
			Philolithus setuosus	2c	Sep 4
			Trogloderus costatus	1a, 5a	Apr 16-Aug 16
			Species 1	2a, 2c, 4c, 5a, 5c	Mar 29-Jul 5
			Species 2	2c	Mar 29

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Species 3	2c	Sep 4
	Trichoptera	Hydropsychidae	Species 1	2c	Jun 13
			Species 2	1a	May 30
		Leptoceridae	Species 1	2c	Jun 13
			Species 2	1a	Aug 6
	Lepidoptera	Arctiidae	*Apantesis proxima*	1a, 3b	Jul 11-Nov 20
		Cossidae	*Givira mucida*	2c	Jun 13-Sep 4
			Hypopta palmata	3b	Jul 5-Aug 2
			Hypopta species	1a	May 30
		Geometridae	*Chlorochalmys* species	5a	Sep 11
			Eubarnesia ritaria	2c, 4c, 5a	May 9-Sep 18
			Glaucina erroraria	2c	Jun 13
			G. mcdunnoughi	2c, 4a	Apr 2-Oct 17
			Hesperumia sulphuria	3b	Jun 6
			Narraga fimetaria	1a	Jul 8
			Nasusina inferior	1a	May 30
			Perizoma custodiata	4c, 5a	May 9-Oct 22
			Semiothisa colorata	2c, 4c	Apr 2-Jun 13
			S. cyda	1a	May 30-Aug 6
			Semiothisa species	1a	Aug 6
			Synchlora aerata	1a	Jul 8-Aug 6
			Species 1	1a	Nov 8
		Hesperidae	**Erynnis funeralis*	1c	Oct 11
			**Helioptes ericetorum*	1c	Oct 11
			Pyrgus communis	1a, 2a, 3a-b	May 30-Jun 6
			Pholisora libya	1a-b, 2a 5a-b	May 15-Sep 15
			Polites sabuleti	1a, 3a-b	Jun 6-Oct 11
			Pseudocopaeodes eunis	1a-b, 3a-c	Apr 19-Oct 11
			Hylephila phyleus	3b	Aug 2-Oct 9
			Atalopedes campestris	3b	Jun 6-Oct 11
		Lasciocampidae	*Malacosoma incurvum*	2c, 3b	Jun 6-13
		Lycaenidae	*Leptotes marinus*	1a	Jun 6-Aug 6
			Brephidium exilis	all localities	Mar 18-Nov 20
			Icaricia acmon	2b, 3b, 3c	Mar 29-Jun 6
			Strymon melinus	1b, 3c, 5a-b	Mar 30-Sep 11
		Lybythiidae	*Libytheana bachmanii*	1a	Nov 8
		Noctuidae	*Agrotis ipsilon*	1a, 3b, 4a	May 30-Oct 9
			Autographa californica	1a, 5a	Oct 22-Nov 8
			Bulia deducta	1a	Jul 8
			Canochares arizonae	1a, 2c	Jul 13
			**Catocala junctura*	1a	Sep 15
			Copicuculia eulipes	1a	Aug 6
			Euxoa auxiliaris	1a	Aug 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
			E. messoria	1a, 2c, 3b, 5a	Oct 9-Nov 20
			E. olivia	1a, 2c, 3b, 4c, 5a	May 9-Nov 20
			E. recula	1a, 2c, 5a, 5c	Oct 17-Nov 8
			E. serricornis	1a	Apr 16
			E. silens	1a	May 30
			E. terrena	1a	Aug 6
			E. tristicula	2a, 4c	Apr 2-Oct 17
			Heliothis obsoleta	3b, 4a	Jul 11-Oct 9
			Heliolonche pictipennis	1a, 5b	Apr 11-18
			Helotropha reniformis	3b	Jun 6-Aug 2
			Heteranassa minor	1a, 5a	May 30-Sep 11
			Lacinipolia audabilis	4c	May 9
			Lacinipolia Species 1	1a	Sep 25
			Lacinipolia Species 2	2c	Oct 17
			Nonagria species	1a, 3b	Jul 8-Aug 6
			Platysenta species	4c	May 9
			Porosagrotis species	5a	Oct 22
			Protorthodes alfkeni	1a, 2c, 3b, 4a, 5a	Sep 11-Oct 17
			Pseudaletia farcta	1a, 3b	Jun 6-Aug 6
			P. unipuncta	1a, 4a	Aug 6-Sep 18
			Pseudanarta singula	1a, 2c, 3b, 4c	Oct 17
			Rhizagrotis albalis	1a, 4a	May 9-30
			Rhynchagrotis anchocelioides	1a,2c,3b,4c	May 9-Oct 17
			Schinia dobla	4a	Apr 9
			S. separata	1a, 2c, 3b	Sep 25-Oct 17
			S. species	1a, 4a, 5a	Sep 11-25
			Scotogramma trifolii	1a, 5a	Aug 6-Sep 25
			Spaelothis chandestina	1a, 2c	Jun 13-Oct 17
			S. havilae	2c	Apr 2
			Spodoptera exugua	1a, 4a, 5a	Aug 6-Oct 22
			S. ornithogalli	1a	Apr 6-Aug 6
			Synedoida ochracea	4a	Sep 18
			S. tejonica	5a	Sep 11
			Trichoplusia ni	1a, 4a, 5a	Sep 11-25
			Tridepia nova	1a, 2c, 3b, 4a	Jun 13-Sep 18
			Tryocnemis saporis	4c	May 9
			Trudestra arida	1a, 2c, 3b, 5a	Jun 6-Nov 20
			Ulosyneda species	3b	Oct 9
			Species 1	1a	Sep 25
			Species 2	2b	Mar 29
			Species 3	1a, 2c	Jun 13
			Species 4	1a	Sep 25
			Species 5	3b	Jul 11

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Species 6	1a, 3b	Aug 6-Oct 9
			Species 7	3b	Jun 6
			Species 8	1a	Nov 8
			Species 9	1a	Apr 16
			Species 10	2c	Apr 2
		Nymphalidae	*Charidryas neumogeni*	4a-b	Apr 9-May 9
			Danaus gilippus	1c	Oct 11
			D. plexippus	1a, 3b	Mar 18-Oct 9
			Nymphalis antiopa	1a, 3b	Mar 18-Jun 6
			Polygonia satyrus	3b	Jul 11
			Vanessa atlanta	2a, 3b	Mar 30-Oct 9
			V. annabella	1a-c, 3b, 4c	Mar 18-Oct 11
			V. cardui	1c, 2a-b, 3a-b, 4a-c, 5c	Mar 18-Oct 11
			V. virginiensis	2a	Mar 30
		Papilionidae	*Papilio rutulus*	1a	May 30
		Pieridae	*Anthocharis cethura*	1a, 2a, 3a, 4a, 5a	Mar 29-Apr 11
			Artogeia rapae	3b	Apr 4-Aug 2
			Colias eurytheme	1a, 3c	Aug 2-Oct 11
			Euchloe hyantis	1a-b, 2a-b, 3a, 3c, 4a-b, 5a-c	Mar 29-Apr 11
			Pontia protodice	1a, 2a, 3a-c, 4a-c, 5a-b	Mar 15-Oct 17
		Psychidae	*Oiketicus* species	2b-c	Enclosed cocoons only
		Pterophoridae	*Oidaematophorus* species	2c, 4c	May 9-Oct 17
		Pyralidae	*Achyra rantalis*	1a	Aug 6
			Crambus Species 1	5a	Sep 11
			Crambus Species 2	1a	Apr 16
			Crambus Species 3	1a	May 30-Jul 8
			Crambus Species 4	5a	Oct 22
			Epheatia kuchniabla	2c	Jun 13
			Hymenia species	3b	Oct 9
			Loxostege ceralis	1a, 4a	Sep 18-25
			L. stricticalis	5a	Sep 11
			Nomophila nearctica	1a, 2c	May 18-Nov 8
			Prorasea sideralis	4a	Sep 18
		Riodinidae	*Apodemia mormo deserti*	4a-b	May 9
			A. mormo nr. virgulti	2a-b	May 2
			A. palmeri	1a, 5b	May 15-Jun 6, Sep 11-16
		Saturnidae	*Hemileuca burnsi*	1a-c, 4a	Sep 18-25
		Sphingidae	*Euproserpinus phaeton*	1a	Jan 29-Mar 18
			Pachysphinx occidentalis	1a	Aug 6
		Tineidae	*Acrolophus variabilis*	4a, 5a	Sep 11-18
			Species 1	1a, 5a	Sep 11-25

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Tortricidae	*Ofatulena duodecemstriata*	1a, 1c	Jul 8-Aug 6
			Species 1	2c	May 30
			Species 2	1a	Jun 13
			Species 3	2c	Apr 2
		Microlepidoptera	Species 1	5a	Oct 22
			Species 2	3b	Aug 2
			Species 3	5a	Oct 22
			Species 4	2c	Jun 13
			Species 5	5a	Oct 22
			Species 6	2c	Jun 13
			Species 7	3b	Nov 20
			Species 8	4c	May 9
			Species 9	1a	Aug 6
	Diptera	Agromyzidae	*Melanagromyza* sp.	5c	Jun 26
			Species 1	3b	Jun 6
		Apioceridae	*Apiocera acuticauda*	1a	Jul 8
			A. pearcei	5a	May 15-Jun 26
			Rhaphiomidas acton	4a	Jul 5
		Anthomyiidae	*Delia angustiventralis*	1a-b, 5a, 5c	Apr 11-16
			D. platura	3a-b, 5c	Apr 4-18
			Hylema cinerella	1a, 2c	Apr 16-Jun 13
			Pegamya duplicata	1a	Apr 16-Jul 8
			P. finita	3b	Oct 9
			Orthacheta sp	2b, 4a	May 2-9
		Anthomyzidae	*Anthomyza* sp.	3b	Jun 6
			Species 1	3b	Jun 6
		Asilidae	*Ablautus basini*	1a-b	Mar 18
			A. californicus	1a	Mar 18
			Asilus californicus	3b	Jun 6
			A. occidentalis	5a	May 15
			Cerotainiops willcoxi	1b	Jul 8
			Cophura clausa	5a	Apr 11
			Efferia near *antiochi*	1a-b	Sep 25
			E. cana	1a, 3b, 4c, 5a	May 9-Jun 13
			E. candida	1a, 5a	Jun 26-Aug 6
			E. producta	5b	May 2-Jun 26
			Efferia sp.	2a, 4b, 4c	May 9-Jun 13
			Megaphorus frustrata	2a-b	Jun 13-Sep 4
			Proctacanthus nearno	1a	May 30
			Saropogon luteus	1a-c, 2a, 3a-c, 4a-b, 5b	May 30-Aug 6
		Asteiidae	*Astiosoma aridum*	1a, 2a	May 2-30
		Bibionidae	*Bibio alpipennis*	1a, 5b	Apr 11-16
			Dilophus tingi	2c	Jun 13
		Bombylidae	*Anthrax irroratus*	2b, 4c, 5b	Mar 29-Jun 26

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Aphoebantus marcidus	5a	Apr 11
			A. mus	3b	Jun 6
			Aphoebantus sp.	2b, 4a, 5a-b	May 9-Oct 17
			Apolysis druias	1a-c, 3b, 4a, 4c, 5a-c	Apr 11-Sep 25
			Apolysis sp. 1	4a-b	Sep 18
			Apolysis sp. 2	5a	Apr 11
			Bombylius californica	2b	Mar 29
			Chrysanthrax pertusus	2a, 4a	Jul 5-13
			Conophorus fenestratus	2a-b, 5b	Mar 29-Apr 11
			Exepacmus sp.	4a, 5a	Apr 9-11
			Exoprosa sharonae	5b	Sep 11
			Geminaria canalis	2a, 4a	May 2-9
			Geron nigripes	all localities	May 30-Nov 1
			Hemipenthes eumenes group	1a, 4a, 5a-b	Apr 9-16
			Heterostylum robustum	3b, 4a	May 9-Aug 2
			Lepidanthrax inauratus	2a-b, 5a-b	May 15-Sep 4
			Lordotus cingulatus	3c, 5a	Sep 11-Oct 9
			L. luteolus	1a, 4a, 5a	Apr 9-Sep 25
			L. striatus	2b-c, 3a	Oct 9-17
			Lordotus sp.	1a	Aug 6
			Mythicomyia antecessor	1a-b, 4a, 5c	Jun 26-Sep 25
			M. armata	5b-c	Apr 11-Oct 22
			M. californica		
			Neodiplocampta sp.	3b	Aug 2
			Oligodranes trochilus	1a, 2a-c, 4a-c, 5a-b	Mar 29-Nov 1
			Pantarbes erinos	5a	May 15
			Paravilla californica	4c	May 9
			P. mercedis	2a-b	Jun 13
			P. syrtis	2a-b, 4a, 4c	May 2-Sep 18
			Poecilanthrax californicus	2a, 2c, 3a, 3c	Oct 9-17
			P. willistoni	2b, 3a-c, 5a	Oct 3-22
			Toxophora virgata	1a, 3b, 3c	Jun 6-Jul 11
			Villa agrippina	1a-b, 2a, 3a-c, 4c, 5a, 5c	May 2-Oct 9
			Villa andrewsi	4c	Apr 9
			V. arenosa	2a	Jun 13
			V. caprea	1a-b	Sep 25
			V. lateralis	4a, 5a-c	May 9-Sep 11
			V. pallida	1c, 2a	May 2-30
			Villa species	1a	Sep 25
		Calliphoridae	*Bufolucilia silvarum*	3b	Jul 11
			Calliphora terrae-novae	3a, 5b	Apr 11-18
			Pollenia rudis	3b	Apr 18
			Species 1	3b	Jun 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Species 2	3b	Jul 11
		Ceratopoginidae	*Culicoides* near *copiosus*	3a	Apr 4-Jun 6
			Dasynelea sp.	3a	Apr 4
			Forcipomyia brevippenis	5c	Apr 11
			Leptoconops sp. 1	3b-c	Apr 4-Jun 6
			Leptoconops sp. 2	2b	Mar 29
			Rhynchohelea sp.	3b	Jun 6
		Chaemyiidae	*Leucopis* sp. 1		
			Leucopis sp. 2		
			Leucopis sp. 3		
			Leucopis sp. 4		
			Leucopis sp. 5		
		Chloropidae	*Biorbitella hesperia*	3a	Apr 18-Jun 6
			Diplotoxa unicolor	3a	Jul 11
			Hippelates sp.	1a, 2a, 3a-c, 4a, 4c, 5c	Apr 4-Oct 22
			Olcella punctifrons	1a, 3a	May 30-Jun 6
			Olcella sp.	1a, 4a-c	May 9-Jul 8
			Siphonella sp.	1c, 2c, 3a-b, 5c	Apr 4-Oct 22
			Thaumstomya rubida	1a, 1c	May 30
			Species 1	2a, 3a-b, 5a-b	May 2-Oct 22
			Species 2	1c, 3c	Apr 4-May 30
			Species 3	3b	Apr 4
		Cecidomyiidae	*Asphondylia* sp. 1	2c, 4a, 5a	Jun 13-Sep 18
			Asphondylia sp. 2	1a, 2c	Apr 16-Oct 17
			Species 1	1c, 3c	Apr 4-Jul 8
		Chironomidae	Species 1	1a, 2c, 3b	May 30-Jun 13
			Species 2	1a, 3a-c	Apr 4-Jun 6
			Species 3	1a, 3a-b	Apr 18-Jun 6
			Species 4	1a	Apr 16
			Species 5	2c, 3b	Apr 18-Jun 13
			Species 6	1a, 3a-b	Mar 18-Jun 6
			Species 7	1a, 3a-b	Apr 16-Jun 6
			Species 8	3a-b	Jun 6
		Chyromidae	*Gymnochiromyia* sp.	1a	Apr 16
		Conopidae	*Physocephala texana*	3a-b	Jun 6-Oct 3
			Thecophora propinqua	1a	Jul 8
			Zodion fulvifrons	1a, 2a, 5a	May 2-Oct 22
		Culicidae	*Aedes varipalpus*	5a	Sep 11
			Culiseta inomata	3b	Jun 6
			Culex peus	3b	Jun 6
		Dolichopodidae	*Dolichopus consanguineus*	3a-b	Apr 18-Oct 9
			Dolichopus sp.	3b	Oct 9
			Hydrophorus eldoradensis	1a, 3b, 5c	Apr 4-May 30
			H. innotatus	2c, 3a-b	Apr 4-Oct 17

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Medetera sp.	1a, 3b	Apr 16-Jun 6
		Empidae	*Drapetis* sp.	1a	Sep 25
			Platypalpus sp.	3a	Apr 4
		Ephydridae	*Ephydra halophila*	2c, 3a-b, 4a	Apr 4-Oct 17
			Mosillus tibialis	1a-b, 2b, 3a-c, 5c	Apr 4-Aug 6
			Parydra sp.	3a-b	Apr 4-18
			Psilopa olga	3a	Apr 4-Jul 11
			Ptilomyia pleuriseta	3a-b	Apr 18-Jul 11
			Scatella paludum	3a-c	Apr 4-Jun 6
			Scatella stagnalis	3a	Apr 18
			Species 1	3b	Jul 11
			Species 2	1a	Mar 18
			Species 3	2c	Jun 13-Sep 4
		Heleomyzidae	*Pseudoleria* sp.	1a, 2c	Apr 2-16
		Milichiidae	*Hemeromyia* sp.	3b	Apr 18
			Leptometopa latipes	1b-c, 5c	Apr 16-May 30
			Milichiella sp.	2b, 3b, 5b	Mar 29-Jun 6
			Milichiella sp.	1c, 2a, 3a-c, 4a-b, 5a-c	Mar 29-Oct 22
		Muscidae	*Lispe* sp.	1a, 2c, 3a-b	Apr 2-Oct 9
			Limnophora narona	3b	Aug 2
			Species 1	5c	May 15
			Species 2	1a	Jul 8
			Species 3	3b	Apr 18
			Species 4	3a-b	Apr 4-18
			Species 5	1c, 2a	Jul 8-Oct 17
			Species 6	3a, 3c, 5b-c	Apr 18-Oct 22
			Species 7	3a-b, 5a, 5c	Apr 4-Oct 22
			Species 8	3b	Apr 18
		Mycetophilidae	*Docosia* sp.	5c	Apr 11
		Otitidae	*Euxesta* sp. 1	3b	Aug 2
			Euxesta sp. 2	3a-b	Apr 4
			Euxesta sp. 3	3b	Aug 2
			Euxesta sp. 4	5c	Apr 11
			Meliera similis	3b	Jul 11-Oct 9
			Physiphora demandata	1a, 5a	Jul 8-Sep 11
		Sarcophagidae	*Blaesoxiphra plinthopyga*	1b, 2a-b, 3c, 4b-c, 5a-b	May 15-Oct 17
			B. omani	1a, 4a, 5a-b	May 9-Sep 11
			Eumachronychia persolla	3c, 5b	Jun 6-26
			Senotainia flvicornis	3b	Aug 2
			Species 1	3b, 4a	May 9-Aug 2
			Species 2	1a	Jul 8
		Scatopsidae	*Coboldia fuscipes*	3a-b	Apr 4-Aug 2
			Species 1	3b	Jun 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Scenopinidae	*Belosta* sp.	5a	Apr 11
			Metatrichia bulbosa	1a, 2a, 3b-c, 4a-b, 5b	May 9-Sep 18
		Sphaeroceridae	*Copromyza equina*	2c	Jun 13
			Leptocera limosa	2c, 3a-b	Apr 4-Jul 11
		Sciomyzidae	*Pherbella vitalis*	3b	Oct 9
		Sepsidae	*Sepsis neocynipsea*	3b	Jul 11
		Simulidae	*Simulium vittatum*	3b	Apr 4
		Stratiomididae	*Dieuryneura stigma*	1a	Jul 8
			Nemotelus arator	3b	Apr 4-Aug 2
			Odontomyia alticola	1a	Sep 25
			O. arcuata	1a, 3b	Sep 25-Oct 9
		Syrphidae	*Allograpta exotica*	3b, 4a	Sep 18-Oct 9
			Ceriana sp.	1a, 3b	May 30-Aug 2
			Eristalis latfrons	1a, 3b, 4b, 5a	Apr 16-Nov 8
			E. tenax	1a	Apr 16
			Eupeodes volucris	5c	Apr 11
			Helophilus bilineatis	3b	Apr 4
			Mesograpta marginata	5a	Oct 22
			Platycheirus stegnus	3c, 5b	Apr 4-11
			Syritta pipiens	3b	Jul 11
		Tabanidae	*Chrysopa discalis*	3a-b	Apr 4-Oct 9
			Silvius abdominalis	3b	Jun 6
			Tabanus punctifer	3b	Jun 6-Jul 11
		Tachinidae	*Angiorhina robusta*	3b	Jun 6
			Cylindromyia armata	4b	May 9
			Deopalpus contiguus	4b	Apr 9
			Euphasiopteryx ochracea	1a	Aug 6-Sep 25
			Gymnosoma fuliginosum	1a, 2a-b, 3c, 4a, 5b	Mar 18-May 9
			Micrachaetina sp.	4c	May 9
			Paradidyma sp.	1a, 2a, 3c	Apr 4-Jul 8
			Peleteria malleola	1a, 3c, 5a	Apr 4-16
			Phasia aldrichii	2b, 4a, 5a-c	Mar 29-Oct 22
			Phasia sp.	4a	Apr 9
			Trichopoda pennipes	2a	Jun 13
			Species 1	3c	Jun 6
			Species 2	1a, 2c	June 13-Jul 8
			Species 3	1a	Jul 8
		Tenthinidae	*Pelomyia* sp.	3b	Apr 4-18
			Pelomyiella sp.	1a, 3b-c	Apr 4-18
		Tephritidae	*Dioxyna picciola*	4a	Sep 18
			Euarestoides acutangulus	1a, 2b-c, 3c, 4a, 5b-c	Mar 29-May 9
			Neaspilota brunneostigmata	1b, 3c, 4a	May 9-Sep 24
			Paroxyma murina	4a	May 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Prececidochares minuta	5a	Apr 11
			Trupanea jonesi	5a-b	Apr 11
		Therevidae	*Pherocera mojavensis*	1b, 2a, 3c	May 30-Jun 13
			Thereva sp. 1	1b	Apr 16
			Thereva sp. 2	1b, 5a, 5c	Apr 11-16
			Thereva sp. 3	1a-b, 5c	Apr 11-Aug 6
		Tipulidae	Dactylobis vestigipennis	2c	Jan 29
			Limnophila sp.	3b	Jun 6
			Tipula sp. 1	1b	Apr 16
			Tipula sp. 2	2c	Apr 2
		Trixoscelididae	*Trixoscelis frontalis*	1a, 1c, 3b-c, 4a, 4c, 5a-c	Apr 4-Jun 6
	Hymenoptera	Andrenidae	*Andrena astragali*	1a, 3b, 4a, 5b	Mar 18-May 9
			Andrena auricoma	1a, 5b	May 30-Sep 11
			Andrena bipunctata	5b	Oct 22
			Andrena cleodora	1d, 4a	Apr 9-18
			Andrena dissimulus	4a	Apr 9
			Andrena levipes	2b	Mar 29
			Andrena prunorum	1a, 4a-b	Apr 9-May 9
			Andrena subchalybea	1a	Apr 16
			Andrena submoesta	2b, 3c, 4a	Mar 29-Apr 9
			Andrena species	2b	May 2
			Nomadopsis puellae	1a	Apr 16
			Nomadopsis scutellaris	3b	Jun 6-Oct 3
			Perdita claypolei	1a	Apr 16
			Perdita intersecta	1a-b, 2a, 3a-b, 4c, 5a	May 2-Oct 22
			Perdita nigrella	1a, 3a, 5a	Apr 11-Jun 6
			Perdita species	1a, 1c	May 30
			Species 1	4b	Apr 9
			Species 2	4a, 5a	Apr 9-11
		Anthophoridae	*Anthophora californica*	2a, 3a-b	Jun 6-13
			Anthophora cockerelli	1a, 5a	Jun 26-Sep 25
			Anthophora flavocincta	3a-c	Jun 6-Aug 2
			Anthophora hololeuca	5b-c	Sep 11
			Anthophora porterae	5a	Apr 11
			Centris hoffmanseggiae	2a, 4b-c, 5a	Apr 9-May 15
			Diadasia australis	2a, 3b-c	Jun 6-Aug 2
			Diadasia enavata	1a, 2a	Jun 13-Sep 25
			Diadasia laticauda	1a, 3a-b	Jul 11-Sep 25
			Melissodes tessellata	1a, 3a-c	Jun 6-Oct 9
			Melissodes Species 1	2b, 3a-c	May 2-Oct 9
			Melissodes Species 2	1a-b, 2c, 3b	Aug 2-Oct 17
			Nomada (*Nomada*) species	4b	Apr 9
			N. (*Holonomada*) species	4a	Apr 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Ptilothrix near bombiformis	2c	Oct 17
			Tetralonia primiveris	4a, 5b	Apr 9-11
			Triepeolus species	1b, 2a, 5a-b	May 2-Oct 22
			Xeromelecta californica	5a	Oct 22
			Species 1	5b-c	Sep 11
			Species 2	3c	Jun 6
			Species 3	5b	Apr 11
		Apidae	*Apis mellifera*	1a, 2a-b, 5a-b	Mar 29-Nov 8
			Bombus crotchii	2c	Jun 13
		Bethylidae	*Epyris* species	1a, 3b, 5a	Jul 8-Sep 11
			Species 1	2a	May 2
		Braconidae	*Agathis* Species 1	3b, 4c, 5b-c	Apr 4-May 9
			Agathis Species 2	1c	Jul 8
			Agathis Species 3	1c, 3c, 5a	Apr 11-Oct 9
			Agathis Species 4	5b	Apr 11
			Apanteles Species 1	1c, 2a, 4b, 5a, 5c	Apr 11-Oct 22
			Apanteles Species 2	5a	Apr 11
			Bracon Species 1	1c, 5b-c	Apr 11-May 30
			Bracon Species 2	1a, 1c, 2c, 5a, 5c	Apr 11-Sep 4
			Bracon Species 3	1b	Jul 8
			Bracon Species 4	1a-b, 2c	Apr 11-Jul 8
			Bracon Species 5	2a	May 2
			Bracon Species 6	5c	Jun 26
			Chelonus species	5a	Apr 11
			Cheloninae species	1c	May 30
			Microgaster species	2c	Oct 17
			Microplitis species	5c	Apr 11
			Species 1	5a-c	Apr 11
			Species 2	5c	May 15
			Species 3	4c	May 9
			Species 4	4a	May 9
		Ceraphronidae	*Dendrocerus* species	4a	Sep 18
			Species 1	1b	May 30-Jul 8
			Species 2	3c	Apr 4
			Species 3	4a	Sep 18
			Species 4	2a	Jun 13
		Chalcididae	*Haltichella* species	1a, 2a, 3a, 5b	Mar 18-Jun 26
			Hockeria species	5b	Sep 11
			Species 1	5c	Apr 11
			Species 2	3b	Jul 11
			Species 3	1c	May 30
			Species 4	5b	May 15
		Chrysididae	*Chrysis astralia*	3a	Jun 6
			Chrysis fuscipennis	3b	Jul 11

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Hedychrum boharti	5b	May 15
			Parnopes edwardsii	3a-b	Jun 6-Oct 3
			Pseudolopyga taylori	1b	Sep 25
		Colletidae	*Colletes clypoenitens*	1a, 1c, 2c, 5a-b	May 15-Oct 22
			Colletes louisae	2b	May 2
			Colletes Species 1	2c, 5a-b	May 15-Oct 22
			Colletes Species 2	4a	May 9
			Colletes Species 3	1a	May 30
			Colletes Species 4	1a-b, 5a, 5c	Sep 11-25
			Colletes Species 5	1a	Sep 25
			Colletes Species 6	1a-b, 2c, 5a-b	Sep 11-Oct 17
			Colletes Species 7	1a, 1c, 2a, 4a-b, 5b	Apr 9-May 30
			Hylaeus episcopalis	5b	May 15
			Hylaeus mesillae	2b, 3b	Jun 6-Jul 11
		Cynipidae	Species 1	5a	Apr 11
			Species 2	3b	Apr 4
		Encyrtidae	Species 1	1a, 1c, 2a, 5a-c	Mar 18-Oct 22
			Species 2	1a, 2b, 4a	Aug 6-Nov 1
			Species 3	2a	Oct 17
			Species 4	1c, 4b, 5b-c	May 9-Oct 22
		Eulophidae	*Aprostocetus* Species 1	2b, 4b	Jun 13-Oct 17
			Aprostocetus Species 2	2a, 2c, 3b, 4a, 4c, 5a-b	Apr 11-Oct 17
			Cirrospilus species	3a	Oct 9
			Diglyphusia species	3a	Jul 11
			Eulophinae species	1a	Mar 18
			Entedoninae Species 1	1a	Jul 8
			Entedoninae Species 2	5a	Apr 11
			Eprhopalotus species	1a, 5b	Mar 18-Oct 22
			Sympiesis species	3c	Apr 4
			Zagrammosoma species	1c	May 30
		Eupelmidae	Species 1	4c	May 9
			Species 2	1b	Sep 25
		Eurytomidae	*Eurytoma* complex	1a-b, 2a, 2c, 4c, 5a-c	Apr 11-Oct 22
			Non *Eurytoma* complex	5a	Apr 11
			Rileya cecidomyiae	1b, 3b 5b	Apr 4-Sep 25
			Rileya hegeli	4a	Sep 18
			Rileya mellea	5b	Apr 11
			Rileya teqularis	2a, 5a-b	Apr 11-Oct 22
		Formicidae	*Camponotus semitestaceus*	5a	May 15
			Crematogaster mormonum	1b	Nov 8
			Dorymyrmex bicolor	1a, 1c	Mar 18-Aug 6
			Dorymyrmex pyramicus	1a	Nov 8
			Formica pilicornis	1a, 3b, 5c	Apr 4-Oct 22

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Formica perpilosa	3b	Apr 4-Oct 3
			Myrmecocystus creightoni	5a-b	Apr 11
			Myrmecocystus mexicanus	4a	Sep 18-Nov 1
			Myrmecocystus mimicus	1a-c, 2b, 4a, 4c, 5a	Mar 18-Nov 8
			Lasius neoniger	1a, 3b, 5a	Apr 4-May 30
			Liometopum occidentale	1a, 3b	Jul 11-Nov 8
			Messor pergandei	2a-c, 3c, 4a-c, 5a	all year
			Pheidole barbata	1c, 4c	Nov 1-8
			Pheidole desertorum	2c, 3a, 5c	Apr 18-Oct 17
			Pogonomyrmex californicus	1a-b, 3b, 4a, 4c, 5a	Mar 18-Jun 26
			Pogonomyrmex rugosus	1c-d, 2a-c, 3a-c, 5c	Mar 29-Nov 8
			Solenopsis xyloni	1a-b, 2a, 3a-b, 4c, 5b	Mar 18-Oct 22
		Halictidae	*Agapostemon melliventris*	1a, 3b	Jul 11-Nov 8
			Agapostemon texanus	1a	Apr 16
			Augochlora species	3b	Apr 4
			Dialictus species	1a-b, 2a, 3a-b, 4a-b, 5a-b	Mar 18-Oct 22
			Dufourea mulleri	3a, 5b	Apr 11-18
			Lasioglossum sisymbrii	1a, 4c	Apr 9-16
			Species 1	3b, 4a	Apr 9-Jul 11
		Ichneumonidae	*Anomalon* species	1c	Jul 8
			Charops species	1c	Apr 16-Jul 8
			Compsocryptus species	5b	Apr 11
			Cremastus species	5a	Oct 22
			Eridolius species	5c	Apr 11
			Erigorgus species	5b	Apr 11
			Netelia Species 1	1a	Apr 16
			Netelia Species 2	3b	Oct 9
			Ophion species	1a	Apr 16
			Pterocormus inurbanus gp	3b	Apr 18
			Species 1	5c	Apr 11
			Species 2	5c	May 15
		Megachilidae	*Anthidium cockerelli*	1a, 2a	May 2-30
			Anthidium mormonum	2a	May 2
			Ashmeadiella aridula	1b, 2a, 3b, 5b	May 2-Jul 11
			Chalicodoma spinotulata	1a, 2a-b, 5b	May 15-Sep 4
			Coelioxys species	1a	Sep 25
			Dianthidium species	1a, 5b	May 15-30
			Dioxys pomonae	5a, 5c	Apr 11
			Dolichostelis perpulchra	1a	Jul 8
			Megachile brevis	1a, 3a-b, 5b	Apr 16-Aug 2
			Megachile concinna	1a	Aug 6
			Megachile discorhina	1a, 4a, 5b	May 9-Aug 6
			Megachile nevadensis	1a, 2a, 3b	Jun 13-Oct 9

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Osmia clarescens	4a, 5a	Apr 9-11
			Osmai titus	5a	Apr 11
			Stellis species	5b	May 15
			Species 1	3c	Jun 6
		Mutillidae	*Chyphotes melaniceps*	1a, 2c, 5a	Jun 13-Oct 17
			Chyphotes mickeli	2c, 3b	Apr 2-Sep 4
			Chyphotes nubeculus	3b, 4a, 5a	Sep 11-Oct 9
			Dasymutilla californica	3b-c	Jun 6
			Dasymutilla species	3b	Jun 6-Oct 9
			Sphaeropthalma Species 1	2a, 2c	Jun 13
			Sphaeropthalma Species 2	3b	Jun 6
			Sphaeropthalma Species 3	2c	Oct 17
			Sphaeropthalma Species 4	3b	Oct 9
			Sphaeropthalma Species 5	1a, 2c, 3b, 4a, 4c	May 9-Oct 17
		Ormyridae	Species 1	4a	May 9
			Species 2	1c	May 30
		Perilampidae	Species 1	1c, 3b	May 30-Jul 11
			Species 2	2a, 5a	Apr 11-Oct 22
		Platygasteridae	Species 1	1b, 2a, 2c, 5a-c	Apr 11-Oct 22
		Pompilidae	*Ageniella blaisdelli*	1c, 3b	Jul 8-11
			Anoplius deora	1b, 3b	May 3-Oct 3
			Anoplius dreisbachi	3b	Apr 18
			Anoplius imbellis	1a-c, 3b-c, 4c, 5a-c	Apr 18-Aug 2
			Anoplius tenebrosus	3c	Jul 11
			Anoplius toluca	3b	Jul 11
			Aporinellus yucatanensis	1a, 5b	May 15-Oct 22
			Aporus hirsutus	1c	May 30
			Pepsis chrysothemia	1a, 2a, 3b-c, 4b-c, 5b	Apr 9-Jul 11
		Proctotrupidae	Species 1	1a, 2c	Jun 13-Jul 8
		Pteromalidae	*Scutellista* species	1b, 3b	Jul 11-Sep 25
			Species 1	1a, 1c, 3b, 4a, 5a-c	Mar 18-Oct 22
			Species 2	1a-b, 2a, 3b-c, 4b	Apr 4-Jul 11
			Species 3	1b-c, 3a-b, 5a, 5c	Apr 11-Oct 22
			Species 4	1c, 2b	Mar 29-30
			Species 5	4b, 5a	Apr 11-May 9
			Species 6	5a	Apr 11
			Species 7	3c	Apr 4
			Species 8	4b	May 9
			Species 9	4b	May 9
		Scelionidae	Species 1	1c, 2a, 2c, 3a, 3c, 5c	May 2-Sep 11
		Sphecidae	*Ammophila aberti*	1a, 2a, 3a	Jun 6-Jul 11
			Ammophila pruinosa	1a, 3b, 4a, 4c, 5a-b	May 9-Oct 22
			Ammophila Species 1	5b	Oct 22

Macro-invertebrate	Order	Family	Species	Localities	Dates
			Ammophila Species 2	4a	Apr 9
			Bembix americana	1a, 3b	Jun 6-Aug 6
			Cerceris californica	2a, 5b	May 15-Jun 13
			Cerceris convergens	1a	Jul 8
			Cerceris sextoides	3b	Aug 2
			Cerceris species	4a	Jul 5
			Chalybion californicum	3b	Jul 11
			Clypeadon lacticinctus	3c	Oct 9
			Diodontus species	5b	Apr 11
			Dryudella aspersa	1a, 5a	Apr 11-16
			Fernaldina lucae	2a	Jun 13
			Foxia navajo	1a-b	Jul 8-Aug 6
			Glenosticta argentata	3b	Aug 2
			Glenosticta scitula	1a	May 30
			Larropsis tenuicornis	1a, 4b	May 9-30
			Liris species	3b	Jul 11
			Microbembix argyropleura	1a-b, 5a	May 15-Aug 6
			Oxybelus argenteopilosus	3a-b	Jun 6-Aug 2
			Oxybelus species	1a-b	Sep 25
			Palmodes californica	4a	May 9
			Palmodes species	1a, 1c, 3a-c	May 30-Aug 6
			Podalonia deserticola	1a, 2b, 3a, 3c, 4b, 5a-b	Apr 4-Nov 8
			Podalonia luctuosa	2b, 3a, 3c, 5b-c	Mar 29-May 15
			Prionyx foxi	1a, 2a-b, 4a, 5a	Jun 13-Jul 8
			Prionyx parkeri	1a-b, 2a-b, 3a, 3c, 5a-b	May 2-Sep 25
			Philanthus levini	1a, 3b	Jul 8-Oct 9
			Philanthus multimaculatus	1a, 3b	Jul 8-Oct 9
			Philanthus ventilabris	1a, 3b	Aug 2-Oct 9
			Sceliphron caementarium	1a, 3b	May 30-Aug 6
			Sphecius convallis	3b	Jul 11-Aug 2
			Sphex ashmeadi	1a, 5b	Aug 6-Sep 11
			Sphex ichneumoneus	3b	Jul 11-Aug 2
			Steniolia duplicata	1a, 2a-b, 3a-c, 5a-c	May 15-Oct 22
			Tachysphex ashmeadii	1a-b, 3c, 5b	May 30-Aug 6
			Tachysphex coquilletti	1a-b, 2a, 3b, 4b, 5b	May 2-Jul 11
			Tachysphex texanus	1a, 2a, 5b	May 15-Sep 4
			Tachytes erimineus	1a, 2a, 4a	Jun 13-Aug 6
			Trypoxylon californicum	3b	Jun 6
			Species 1	1a, 3a-c	Jun 6-Jul 11
			Species 2	1a, 3b-c	Jun 6-Jul11
			Species 3	5b	May 15
			Species 4	5b	Jun 26
		Scoliidae	*Campsomeris plumipes*	1a, 3b	Jul 8-Aug 6
			Scolia species	1a, 3b	Jul 8-Aug 6

Macro-invertebrate	Order	Family	Species	Localities	Dates
		Tiphiidae	*Brachycistis carinata*	1a, 3b, 4c, 5a	May 9-Sep 11
			Brachycistis ioachinensis	2c, 3b	Apr 2-Oct 17
			Brachycistis inaequalis	1a, 2c, 3b, 4c	Apr 2-Oct 17
			Brachycistis lacustris	1a, 3b, 4c, 5a	Apr 16-Sep 11
			Brachycistis triangularis	4a	Sep 18
			Brachycistis Species 1	4a, 4c, 5a	May 9-Sep18
			Brachycistis Species 2	1a, 2c	Jun 13-Sep 4
		Torymidae	Species 1	2a	Oct 17
			Species 2	5c	Apr 11
			Species 3	5b	Oct 22
			Species 4	1a	May 30
			Species 5	1a	Mar 18
			Species 6	2a	Jun 13
		Vespidae	*Ancistrocerus adiabatus*	5a	Oct 22
			Ancistrocerus crucifera	3b	Jul 11-Aug 2
			Euodynerus annulatus	1a, 1c, 4a	Jul 5-Aug 6
			Euodynerus exoglyphus	1c, 3a-b, 5b	Jun 6-Aug 2
			Euodynerus nidalgo	1a, 3a	Jul 8-11
			Leptochilus electus	2a	May 2
			Leptochilus species	2b, 5b	May 15-Sep 4
			Parancistrocersu mcclayi	1a, 3b	Jun 6-Sep 25
			Polistes fuscatus	3a-c	Apr 4-Oct 9
			Pterocheilus trachysomus	5b	Jun 26
			Pterocheilus species	2a	Jun 13
			Vespula pensylvanica	1a	Nov 8
			Species 1	5a	Jun 26

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 1998	Final report

4. TITLE AND SUBTITLE
Terrestrial Invertebrates of Edwards Air Force Base, 1996

5.FUNDING NUMBERS

6. AUTHOR(S)
Gordon Pratt

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
University of California at Riverside
Department of Technology
Riverside, CA 92521

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Edwards Air Force Base
Edwards, CA 93523;
U.S. Army Engineer Waterways Experiment Station
3909 Halls Ferry Road, Vicksburg, MS 39180-6199

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
Technical Report EL-98-18

11. SUPPLEMENTARY NOTES
Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

An invertebrate survey was performed on Edwards Air Force Base during the 1996 season (April through October). Survey methods involved sweeping of blooming and nonblooming vegetation, searching for invertebrates beneath rocks, logs, and other objects, searching for diurnal and nocturnal crawling, flying, and calling invertebrates, and collecting nocturnal invertebrates drawn to a mercury vapor light. From this study, 974 species were collected. Of these species, approximately 98 percent were insects and over 95 percent belonged to the eight major insect orders: Coleoptera, Lepidoptera, Diptera, Hymenoptera, Orthoptera, Homoptera, Hemiptera, and Neuroptera. One very rare Chrysopid, *Pimachrysa albicostales*, and a new species of Scarabaeid, in the genus of *Serica*, were collected by this study. Only two specimens of the *Pimachrysa* were previously known. Considering that less than 20 percent of the invertebrates have been identified by experts, it is quite probable that there are other undescribed species found at Edwards Air Force Base.

14. SUBJECT TERMS

Arthropods	Insects	Scorpions
Conservation	Invertebrates	Spiders
Environmental impacts	Mojave Desert	

15. NUMBER OF PAGES
43

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED		